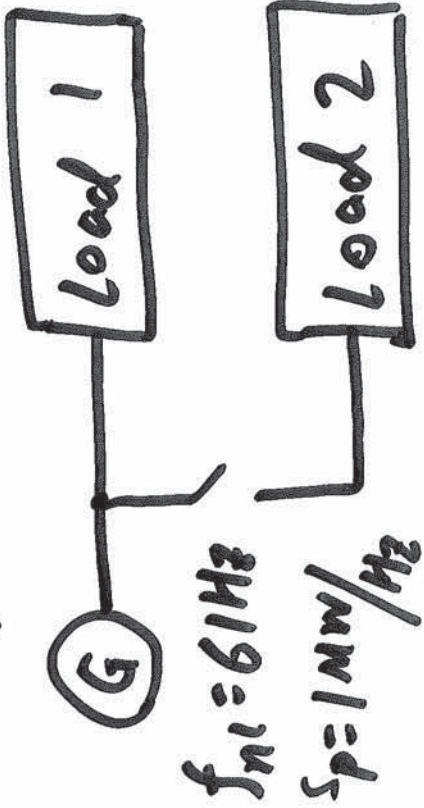


Example 4-5



1000 kW,  $Pf = 0.8$  lagging

800 kW,  $Pf = 0.707$  lagging

(a)  $P = 1000 \text{ kW}$

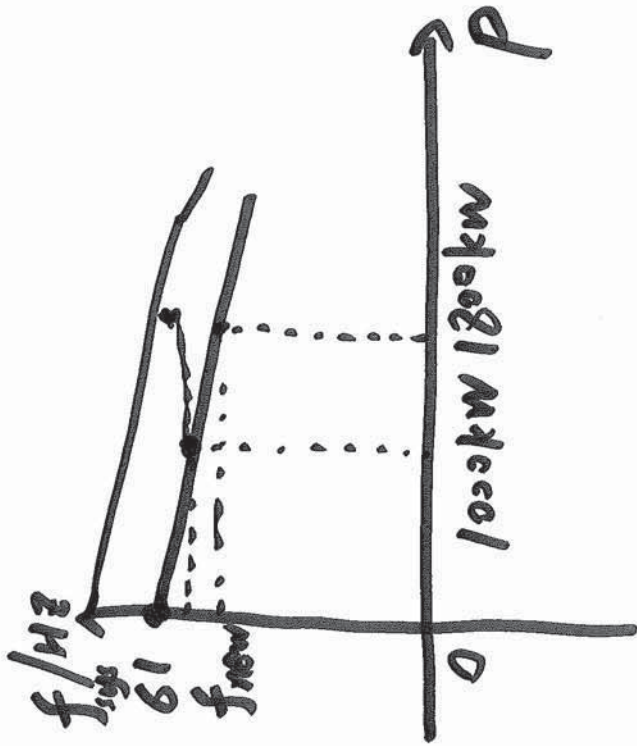
$$1000 = -1000 f_{sys} + 1000 \times 61$$

$f_{sys} = 60 \text{ Hz}$

(b)  $P = 1000 + 800 = 1800 \text{ kW}$

$$1800 = -1000 f_{sys} + 1000 \times 61$$

$f_{sys} = 59.2 \text{ Hz}$



$$\begin{aligned}
 P = S_p (f_{nl} - f_{sys}) &= -S_p f_{sys} + S_p f_{nl} \\
 &= -1000000 f_{sys} + 1000000 \times 61
 \end{aligned}$$

## Example 4-6

$$(a) P = S_p (f_{nl} - f_{sys})$$

$$P_1 = S_{p1} (f_{nl1} - f_{sys})$$

$$P_2 = S_{p2} (f_{nl2} - f_{sys})$$

$$P_1 = S_{p1} (f_{nl1} - f_{sys})$$

$$= 1 (61.5 - 60)$$

$$= 1.5 \text{ MW}$$

$$P_2 = S_{p2} (f_{nl2} - f_{sys})$$

$$= 1 \text{ MW}$$

$$P_{load} = P_1 + P_2$$

$$= S_{p1} (f_{nl1} - f_{sys})$$

$$+ S_{p2} (f_{nl2} - f_{sys})$$

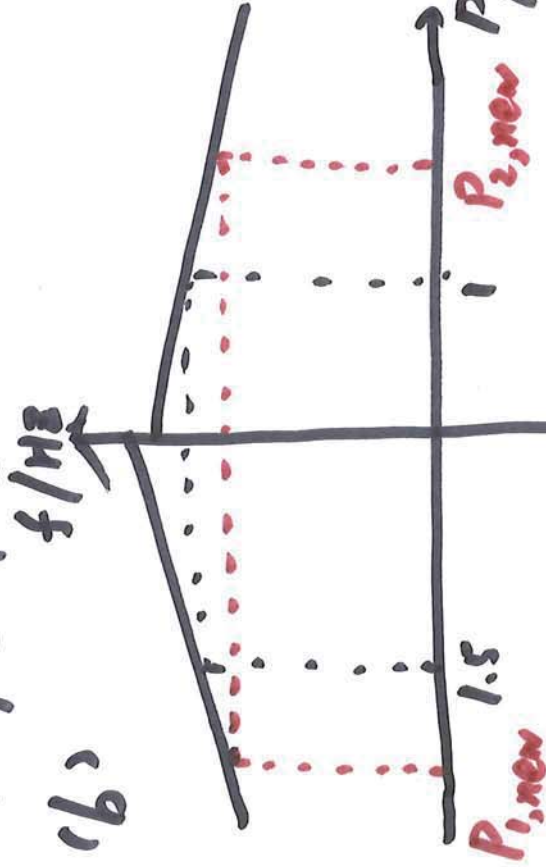
$$2.5 \text{ MW} = 1 \frac{\text{MW}}{\text{Hz}} (61.5 - f_{sys})$$

$$+ 1 \frac{\text{MW}}{\text{Hz}} (61 - f_{sys})$$

$$f_{sys} = \frac{122.5 - 2.5}{2} = 60 \text{ Hz}$$

## Example 4.6

(b)



$$P_1 = SP_1 (f_{nl1} - f_{sys})$$

$$P_2 = SP_2 (f_{nl2} - f_{sys})$$

$$P_{load} = P_1 + P_2$$

$$= SP_1 (f_{nl1} - f_{sys})$$

$$+ SP_2 (f_{nl2} - f_{sys})$$

$$3.5 \text{ MW} = 1 (61.5 - f_{sys})$$

$$+ 1 (61 - f_{sys})$$

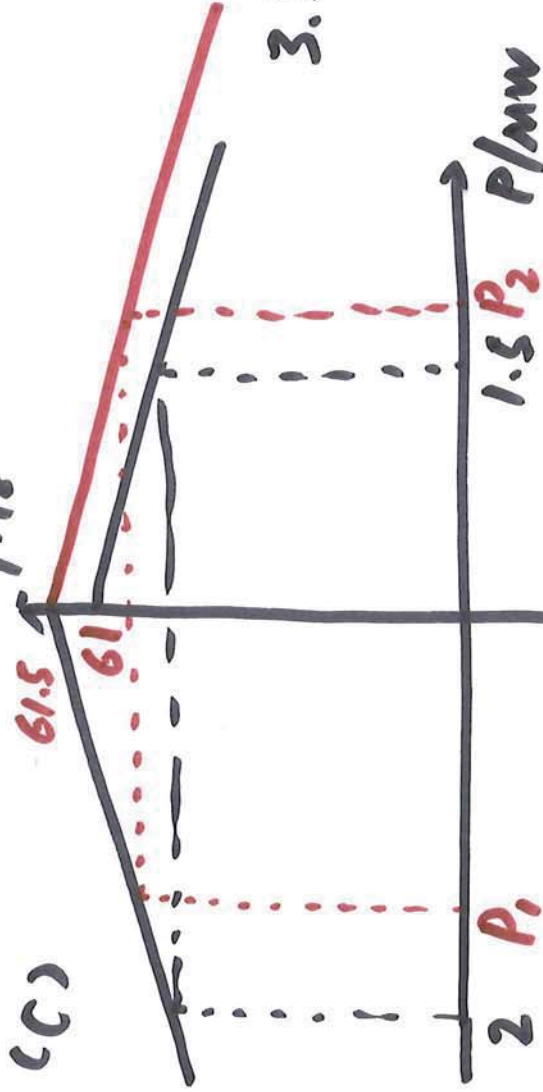
$$f_{sys} = \frac{122.5 - 3.5}{2}$$

$$= 59.5 \text{ MHz}$$

$$P_{1,new} = 2 \text{ MW}$$

$$P_{2,new} = 1.5 \text{ MW}$$

Example 4-6  $f/\text{Hz}$



$$\begin{aligned}
 P_{load} &= P_1 + P_2 \\
 &= sp_1 (fn_1 - f_{sys}) \\
 &\quad + sp_2 (fn_2 - f_{sys}) \\
 3.5 &= 1 (61.5 - f_{sys}) \\
 &\quad + 1 (61.5 - f_{sys}) \\
 f_{sys} &= 59.75 \text{ Hz}
 \end{aligned}$$

$$P_1 = sp_1 (fn_1 - f_{sys})$$

$$P_2 = sp_2 (fn_2 - f_{sys})$$

$$P_1 = 1.75 \text{ MW}$$

$$P_2 = 1.75 \text{ MW}$$